PB80-226194

'Valley of the Drums'
Bullitt County, Kentucky

(U.S.) Environmental Protection Agency
Washington, DC

Aug 80

U.S. Department of Commerce
National Technical Information Service
NTIS

Please read instructions on the reverse before completing.

1. REPORT NO.	2.	3. RECIPIENT'S ACCESSION NO.
EPA-430/9-80-014		PB 80 226194

4. TITLE AND SUBTITLE	5. REPORT DATE
"Valley of the Drums" - Bullitt County, Kentucky	August 1980
	6. PERFORMING ORGANIZATION CODE 52041001
7. AUTHOR(S)	8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS Oil and Special Materials Control Division (WH-548) Office of Water Program Operations Washington, D. C. 20460	10. PROGRAM ELEMENT NO. B51B2D 11. CONTRACT/GRANT NO.
12. SPONSORING AGENCY NAME AND ADDRESS Office of Water Program Operations U. S. Environmental Protection Agency Washington, D. C. 20460	13. TYPE OF REPORT AND PERIOD COVERED technical report 14. SPONSORING AGENCY CODE 700/02

15. SUPPLEMENTARY NOTES

16. ABSTRACT

This document is a report outlining the key actions of the Federal On-Scene Coordinator (OSC) who directed Federal pollution control efforts at the captioned event. The OSC report is required by Section 1510.56 of the National Oil and Hazardous Substances Pollution Contingency Plan (Federal Register, Vol. 45, No. 55 - Wednesday, March 19, 1980).

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
On-Scene Coordinator report		

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS (This Report)	21. NO. OF PAGES
Release to the public	unclassified	
	20. SECURITY CLASS (This page) unclassified	22. PRICE

EPA Form 2220-1 (Rev. 4-77) PREVIOUS EDITION IS OBSOLETE

United States
Environmental Protection
Agency

Oil and Special Materials
Control Division
WH-548
Washington, D.C. 20460

EPA-430/9-80-014
August 1980

PB80-226194

Water and Waste Management

EPA

"Valley of the Drums"
Bullitt County, Kentucky

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

EPA-430/9-80-014
August 1980

VALLEY OF THE DRUMS

BULLITT COUNTY, KENTUCKY

U.S. ENVIRONMENTAL PROTECTION AGENCY
OIL AND SPECIAL MATERIALS
CONTROL DIVISION
WASHINGTON, D.C. 20460

PREFACE

This report reflects the activities of the Environmental Emergency Branch (EEB) Region IV, EPA, as it was concerned with the captioned event. The report outlines the key actions of the Federal On-Scene Coordinator, the Regional Response Team (RRT), the state, local, and Federal members of the RRT. It reflects the complexity of responding to environmental emergencies and the need to coordinate and plan in advance for a major incident such as this event.

This report is intended to satisfy the requirements of the National Oil and Hazardous Substances Pollution Contingency Plan and to help others learn from our experiences.

Al J. Smith

Al J. Smith, Chief

Environmental Emergency Branch

TABLE OF CONTENTS

SECTION		PAGE
1.	SUMMARY	1-1
2.	THE SITUATION	2-1
3.	PHOTOGRAPHS	3-1
4.	CONTAINMENT AND TREATMENT	4-1

LIST OF ILLUSTRATIONS

FIGURE		PAGE
4-1	TREATMENT SYSTEM IN PLAN	4-6
4-2	TREATMENT SYSTEM PROFILE	4-7
4-3	WATER and SEDIMENT SAMPLING LOCATIONS	4-9
4-4	WATER QUALITY STATIONS	4-10

TABLE		
4-1	TEST RESULTS OF WATER and SEDIMENT SAMPLING	4-12

1. SUMMARY

At 2:00 p.m., on March 2, 1979, Robert Sholar of Kentucky's Division of Hazardous Materials and Waste Management contacted the Environmental Emergency Branch of EPA Region IV. Mr. Sholar reported that oil and other hazardous materials were spilling into Wilson Creek as a result of rain runoff and leaching.

Under authority of Section 311 of the Clean Water Act (Federal Water Pollution Control Act, amended 1972), Jack Stonebraker responded as the federal On-Scene Coordinator and departed for Shepherdsville, Kentucky. Assistance was requested from the Coast Guard Gulf Strike Team, the EPA Emergency Response Team (ERT), and the Coast Guard Public Information Assistance Team. OH Materials of Findlay, Ohio, was contracted for work required to control pollution occurring at the dump site.

A survey of the dump site was conducted on March 3, 1979, and construction began on an underflow dam approximately one-half mile downstream from the source of the pollution. Lawyers for the property owner, Mrs. A. L. Taylor, were contacted and permission was obtained to continue work on the site in an effort to control the runoff and eliminate the pollution of Wilson Creek. Men and equipment began moving and relocating drums in order to clear work areas and provide access to land at the base of the hill on which the dump is situated. Water samples were taken and a news release was issued to the media late in the evening.

The following day, March 4, a sufficient number of drums and debris had been relocated, allowing equipment to begin grading a shallow ditch along the base of the hill for control and collection of runoff. Heavy rain the night before caused stream waters to rise and it was necessary to enlarge the underflow dam.

Operations resumed on March 5. Crews continued to relocate drums and segregate full and empty drums. Empty drums not suitable for possible reuse were crushed. Heavy equipment was used to dig a trench at the base of the dump site. A catch pond was constructed at the lowest point on the property to collect runoff and seepage from the diversion ditches and trench. A limited Regional Response Team meeting was held with representatives from the state. Alternatives for dealing with the problems presented by the dump site were discussed along with the state's long-term plans for the "Valley of the Drums." Preliminary sample analysis was performed by Environmental Consultants, Inc., in Clarksville, Indiana. Results showed the presence of oil, benzenes, toluene, and ketones in Wilson Creek. Based on this information, it was decided to begin aeration of stream water with compressed air to strip volatile organic chemicals. Aeration was begun in the stream near the dump and farther downstream, immediately behind the earthen dam constructed on March 3.

On March 6, a third aeration system was established in the field adjacent to the dam. Water was pumped from the pool behind (upstream) the dam through spray nozzles on irrigation pipes and into the air. The natural drainage of the field carried this aerated water back into Wilson Creek, upstream of the dam.

The next day, March 7, it was decided to establish a filtration system for treating runoff and seepage collected in the catch pond. The system would pump this runoff through bins or cells. The first cell would contain limestone, the second, peat moss, and the third, activated carbon. It was felt that this treatment, in addition to aeration, would be necessary before allowing the collected runoff to enter Wilson Creek. Procurement of the materials required for the treatment system began and drum relocation and segregation continued.

The filtration system was not considered operational until March 12 because of the materials and logistics involved with its establishment. The second cell containing peat moss did not work. The peat moss had the same consistency as soil and rose to the top. The peat moss was removed and replaced with activated carbon.

Sampling for a biological and chemical survey began on March 8. ERT members and state personnel collected samples that were sent for analysis to EPA's laboratory in Athens, Georgia. Al Smith, Chief of EPA Region IV Environmental Emergency Branch, met with Eugene Mooney, Secretary of the Kentucky Department of Natural Resources and Environmental Protection (KDNREP), and 20 other representatives of the state to discuss EPA plans and to establish a program of mutual effort and cooperation.

On March 9-11, operations consisted primarily of filtration system construction and drum relocation and segregation. Samples were collected from the catchment basin and from effluent of the modified treatment system. Samples were analyzed by Environmental Consultants, Inc., on March 13, 1979. The preliminary results indicated a 99% reduction of organic chemicals through the treatment system. Only a slight trace of toluene (1-5 ppb) was found in the effluent sample.

EPA and KDNREP held a joint press conference on-site. The media toured the work site and observed the treatment system in operation.

Approximately 20,000 drums of hazardous substances were uprighted and placed in rows. Each drum was marked to indicate whether it was empty or contained solids, sludge, or liquids. Personnel from KDNREP conducted an inventory of the remaining drums. The empty drums that could be reused were stacked while the damaged ones were crushed.

2. THE SITUATION

During a routine inspection of the Taylor site, commonly referred to as the "Valley of the Drums," Robert Sholar, Kentucky Department of Natural Resources and Environmental Protection (KDNREP), Division of Hazardous Materials and Waste Management, noticed a discharge of oil and hazardous substances into Wilson Creek. The recent rains had flushed the material into the creek and it was flowing downstream.

EPA was already aware of the "Valley of the Drums" and the potential for a discharge of oil into the creek via surface runoff. In January 1979, several on-site visits revealed a large quantity of drums (between 20,000 and 100,000) on the surface of the 23-acre site. An unknown quantity of drums may also have been buried at this site. At the time of the visits, however, the ground was frozen and covered with snow. There wasn't any apparent discharge of oil or chemicals into the surface waters.

RESPONSE AND OBSERVATIONS: CHRONOLOGICAL EVENTS

March 2, 1979

Mr. Sholar reported his findings to the Environmental Emergency Branch (EEB) of EPA Region IV, and indicated that the material entering Wilson Creek was multicolored. The spilled material already present on the ground would continue to enter the creek unless some action was taken.

The OSC asked Mr. Sholar if oil was being discharged into Wilson Creek. His answer was affirmative and he indicated that a large number of drums containing waste oil had been transported from Ford Motor Company to this site.

EPA Region IV EEB Chief, Al Smith, and the OSC notified John White, Regional Administrator for EPA Region IV, of the incident. Mr. White said he would inform Eugene Mooney, Secretary of KDNREP, that EPA was responding to the spill under Section 311 of the Federal Water Pollution Control Act.

The following teams were activated to assist the On-Scene Coordinator (OSC) Jack Stonebraker:

EPA's Emergency Response Team (ERT)
National Strike Force - USCG Gulf Strike Team (GST)
USCG Public Information Assistance Team (PIAT)
OH Materials, Inc.

The OSC arrived on-scene with personnel from OH Materials, Inc., and met with Mr. Sholar. There were three definite areas where oil and chemical discharges were entering Wilson Creek.

A sheen of oil on the water surface was observed for about one-fourth mile. The banks were covered with a gray residue that had been there for some time. The sediment in the stream was covered with the same type of material. When the sediment was disturbed, a strong odor of solvent-type material was emitted.

It was clear that Section 311 of the Federal Water Pollution Control Act was being violated. The problem was to contain the surface runoff from this site. Plans were to start work on March 3, 1979, when the equipment would arrive on-scene.

March 3, 1979

Bob Sholar notified Mrs. A.L. Taylor, owner of the property, that oil and other chemical compounds were being discharged into Wilson Creek. EPA had responded to this incident and needed permission to get on her property and contain the discharge. It was believed that Mr. A. L. Taylor's will had not been probated. Also, KDNREP had

issued a complaint against Mrs. Taylor to remove the drums of industrial waste. Mrs. Taylor informed Bob Sholar that she would not give permission until her attorney had been advised.

At 1:00 p.m., Mrs. Taylor met the response group at the site. Credentials were presented to her and she unlocked the gate to the property. She stipulated that no one from the media be allowed in, and that the gate be locked every night. Mrs. Taylor was told that her request would be honored.

The first action was to construct an underflow dam about one-half mile downstream from the site. This would contain the floatable materials, but not the soluble chemical compounds. Samples were needed to determine what type of chemicals were present. It was evident that volatile organics were in the water column. These organics could be removed by aeration.

Plans were made to put in ring aerators at two locations, one about one-fourth mile downstream from the site and the other at the dam.

Work began on constructing a catchment basin at a low point near Wilson Creek where the discharge of oil and hazardous substances was entering the stream. Trenches would also be constructed so the surface runoff could be collected in the catchment basin.

Drums of industrial waste were scattered all over the property, impeding the flow of the surface runoff. Some of these drums were leaking, others were empty. In order to get to the leaking drums, the empty drums had to be moved and arranged in rows.

Data was needed on what was being discharged into the stream. Bob Sholar said that Environmental Consultants, Inc., in Clarksville, Indiana, had done some work for the state. He contacted Robert Fuchs of that firm. Mr. Fuchs agreed to assist in collecting samples and promised a quick turn-around time for qualitative analyses.

March 4, 1979

The rain that fell during the night caused the waters of Wilson Creek to rise considerably. The water was flowing around the end of the underflow dam. The design of the dam was changed to allow water

to flow through pipes near the top. This drop in elevation would provide additional aeration and increase the stripping effect of the volatile organic compounds.

Work continued on the construction of trenches and catchment basins. The drums were arranged in rows and marked as solid, liquid, sludge, or empty. The empty drums that could not be reused were crushed and piled in one area.

The qualitative analyses of the samples collected by Bob Sholar on March 2, 1979, and analyzed by Environmental Consultants, Inc., were received. Ten compounds were identified; xylene, toluene, benzene, and ketones were the primary compounds. These could be removed by aeration and sorbent materials. Additional samples were collected this date.

Members of the Regional Response Team (RRT) were notified that a meeting would be held at the Command Post in Shepherdsville, Kentucky, at 10:00 a.m. on March 5, 1979. It would be a limited activation of the RRT. Representatives from KDNREP, the Department of the Interior (DOI), and the U.S. Coast Guard were asked to attend.

March 5, 1979

At 10:00 a.m., the RRT met to discuss the situation created by the discharge of oil and hazardous substances into Wilson Creek. The following members attended:

Jack Wilson, KDNREP
Clyde Baldwin, KDNREP
Captain Ralph Bartell, USCG
Waynon Johnson, DOI
Jack Stonebraker, EPA OSC
John Gilbert EPA ERT
Mike Donohoe, USCG Gulf Strike Team

The RRT suggested that a chemical and biological study on the affected drainage basin be conducted. Personnel from EPA, KDNREP, and DOI would plan and conduct the survey.

Jack Wilson advised the RRT that rearranging the drums at the site may have jeopardized the state's legal action against the property owner and its effort to encourage the generators to remove the drums. When questioned about the state's case against the generators, Mr. Wilson indicated that, legally, it was questionable. However, the state felt that the generators of the industrial waste had a "moral" obligation to remove the drums from the site.

To control the source of pollution, it was necessary to move full and empty drums in order to get to the leaking drums. All that that involved was setting the drums upright in the same general area. It was difficult to understand how this action would jeopardize the state's complaint against Mrs. Taylor or the generators.

It was finally agreed to continue this phase of the operation. The RRT would convene at a later date.

The in-stream treatment devices would be utilized until the catchment basin was in place. In addition to the ring aerator placed at the dam site, water would be pumped through a header system whereby the volatile organics could be removed by air stripping.

Gene Coker and Fred Wolfe of EPA arrived on-scene to assist in the collection of core sampling. This operation had already been planned. The hydrogeological survey would begin on the next day.

March 6, 1979

Work continued on construction of trenches and the catchment basin. In consultation with Gene Coker of EPA, it was decided to cut the lower trench to a depth of five feet. This would intercept the lateral underground migration of oil and chemical compounds.

An area about two acres in size was discovered where the trees and other vegetation had been destroyed by surface runoff from the Taylor site. The contaminated soil in this area was 2-3 feet deep. Another trench was constructed to intercept the runoff. The trench was designed to direct the runoff into the catchment basin.

During the process of clearing an area just above the catchment basin, a partially exposed drum was noticed. A small area around this drum was uncovered and a pit or trench containing several buried drums was discovered.

The drums were in poor condition and leaked a black oily substance. The pit remained open for several days and filled with the black substance.

An additional pit was discovered on the north side of the road near two power line poles. Apparently, while Mr. Taylor was operating at this site, he constructed several pits, dumped the contents of the drums into them, and covered the pits with soil. There were probably several other underground pits on this site. Where they were located was unknown.

Mr. Fuchs of Environmental Consultants, Inc., reported some preliminary data on the samples collected from the leachate that was entering Wilson Creek. The results were as follows:

SUBSTANCE	CONCENTRATION
Oil	252.0 ppm
Methyl Ethyl Ketone	5.0 ppm
2 - butanol	21.0 ppm
Methyl Iso Butyl Ketone	7.0 ppm
Benzene	0.5 ppm
3 - methyl 2 - pentanol	5.0 ppm
Toluene	5.0 ppm
Methyl Iso Amyl Ketone	1.0 ppm
Methyl Iso Amyl Ketone (Cellosolve)	10.0 ppm
5 - methyl 2 - hexanol	
Kylene	5-10 ppm

Cadmium, lead, and chromium were also found in these samples.

The ring aerator that was placed in Wilson Creek about one-fourth mile downstream from the site brought up the bottom sediments. The waters of this stream turned gray and a strong odor of solvents was emitted. The streambed was covered with this material for about one-half mile. It is evident that contaminated surface runoff from this site had been entering Wilson Creek for a long time.

March 7, 1979

The area on the east side of the valley near the block house was saturated with spilled chemicals. To control the runoff from this

area, it was decided to extend the trench from the catchment basin up to the block house. Work began on the trench this date. With the completion of the trench, it was possible to collect the surface runoff in the catchment basin.

Now that the collection system was about to be completed, a decision had to be made on how to treat the wastewater in the catchment basin. Al Smith arrived at the site to assist the OSC in the design of a temporary wastewater treatment facility. Considering the type of chemicals being discharged into Wilson Creek, Mr. Smith suggested a three-cell treatment facility. The first cell would contain crushed limestone, the second, peat moss, and the third, activated carbon. To remove the volatile organic compounds, the first cell could be aerated.

Biologists from EPA, DOI, and KDNREP met to discuss plans for the collection of biological and chemical samples. They decided to collect six water samples and five sediment samples from Wilson Creek, the catchment basin, and an open pit located on the site. In addition, a static bioassay would be conducted on water collected from certain stations.

Al Smith was instructed to attend a meeting of Secretary Mooney and staff in Frankfort, Kentucky. The purpose of the meeting was to discuss plans for a solution to the problems of disposal and containment of surface runoff.

Crews continued to segregate and organize the drums.

March 8, 1979

It was decided to use two dempsey dumpsters as containers for the limestone and activated carbon. They would arrive at the site on March 9, 1979. The contractor began ordering PVC pipe and other materials to be used in the treatment system. Samples were collected for the biological/chemical survey analyses to be conducted in the EPA laboratory in Athens, Georgia.

Mr. Smith returned from the meeting in Frankfort, Kentucky, with the following information:

Jack Wilson would be the coordinator for state actions with the drums.

State personnel agreed with the drum organization and segregation and wanted to assist in operations.

The state planned to initiate an inventory of the drums on March 12, 1979.

Mr. Mooney requested a joint press conference between EPA and KDNREP to discuss treatment systems and future plans for this site.

March 9-11, 1979

The dumpsters were set on a gravel base. Piping was arranged to provide upflow through the first cell of crushed limestone and second cell of activated carbon. (The use of peat moss in the second cell had proved unsuccessful because it kept flowing over the top. Activated carbon was substituted to alleviate the problem.) Compressed air would be pumped through the ring in the bottom of the first cell for aeration. A weir was constructed in the final cell for distribution over the activated carbon (downflow).

An electrical submergible pump was installed to pump water from the pond to the first cell. The pump would be activated when water in the catchment basin reached a certain level. The water for the aeration system would also be activated when the pump was operating.

A bridge or catwalk was constructed from the edge of the catchment basin to the center. This would enable the operator to raise or lower the pump and to provide the necessary maintenance.

Ben Eason of the PIAT made arrangements with Ed Shelley of KDNREP for a joint news conference on March 13, 1979. The conference would be held at the work site.

As of this date, 8,641 drums had been segregated and organized in rows. This amounted to one-third of the work area, or two acres.

March 12, 1979

Work continued on the construction of the filtration plant. The primary problem encountered was the leaking of the containers. It was necessary to weld all of the seams in the containers.

The drums were organized at the rate of about 900 per day. KDNREP said that the inventory of drums would be delayed until the drums could all be arranged.

Plans were made for a final RRT meeting to be held in Shepherdsville, Kentucky, on March 14, 1979.

Operation of the filtration plant began at 5:00 p.m. The flow rate through the system was varied from 60 gallons per minute to 300 gallons per minute The best flow rate was 60 gallons per minute, or 8,640 gallons in a 24-hour period. Samples were collected from the catchment basin and the effluent. The samples were analyzed by Environmental Consultants, Inc., to determine the efficiency of the treatment system.

March 13, 1979

KDNREP obtained permission from Mrs. Taylor and her attorney for representatives from the news media to tour the work site.

The preliminary analysis of the samples of influent and effluent of the filtration plant indicated a 99% reduction of organic compounds through the system. Only toluene, at 3 ppb, was found in the effluent sample.

The press conference was held on-scene. Jack Wilson, Deputy Commissioner for KDNREP and Jack Stonebraker, EPA OSC, were the spokesmen for their respective agencies. Afterward, the news media toured the work site, took photographs, and interviewed the OSC and Mr. Wilson. The media representatives were impressed with the accomplishments of the work crews in controlling the runoff and installing the treatment system.

Al Smith notified the OSC that polychlorinated biphenyls (PCBs), Aroclor 1254 and Aroclor 1260, had been found in samples collected by EPA on February 14, 1979. These were preliminary results and not for publication. It was believed that PCBs were in the sediment samples and not in the ambient water samples.

An estimated 1,000 drums were organized in rows and marked as solid, liquid, sludge, or empty on this day.

March 14, 1979

The RRT meeting was held at 10:00 a.m. The following topics were discussed:

Mr. Wilson stated that Bob Sholar would monitor the site and operate the treatment system. However, the state did not have funds to replace any equipment or to provide any maintenance to the treatment system.

EPA agreed to maintain the treatment system for an undetermined period of time (at least through spring, because of the heavy rains that generally fall during this time).

Mr. Sholar would collect samples of influent and effluent after a heavy rain. It had not rained since the collection system had been constructed.

State personnel would continue the inventory of drums. EPA would continue to upright drums for source control.

About $190,000 from the contingency fund had been spent. The OSC requested that another $100,000 be authorized under the project number.

March 15-21, 1979

Work continued on segregating and organizing drums. This work was completed on March 21, 1979. A total of 20,000 drums had been marked solid, liquid, sludge, or empty. The empty drums that were not usable were crushed.

It was necessary to replace the wood barrier between the two activated carbon cells with a metal barrier in the filtration plant. Otherwise, the treatment system was working well.

Approximately $290,000 was expended from the contingency fund to control and provide treatment to the surface runoff from this site.

3. PHOTOGRAPHS

AERIAL VIEW OF VALLEY OF THE DRUMS NEAR LOUISVILLE, KENTUCKY

DRUMS CONTAINING SOLVENTS, PAINTS, AND ACID

DRUMS PRIOR TO CLEANUP ACTIVITIES

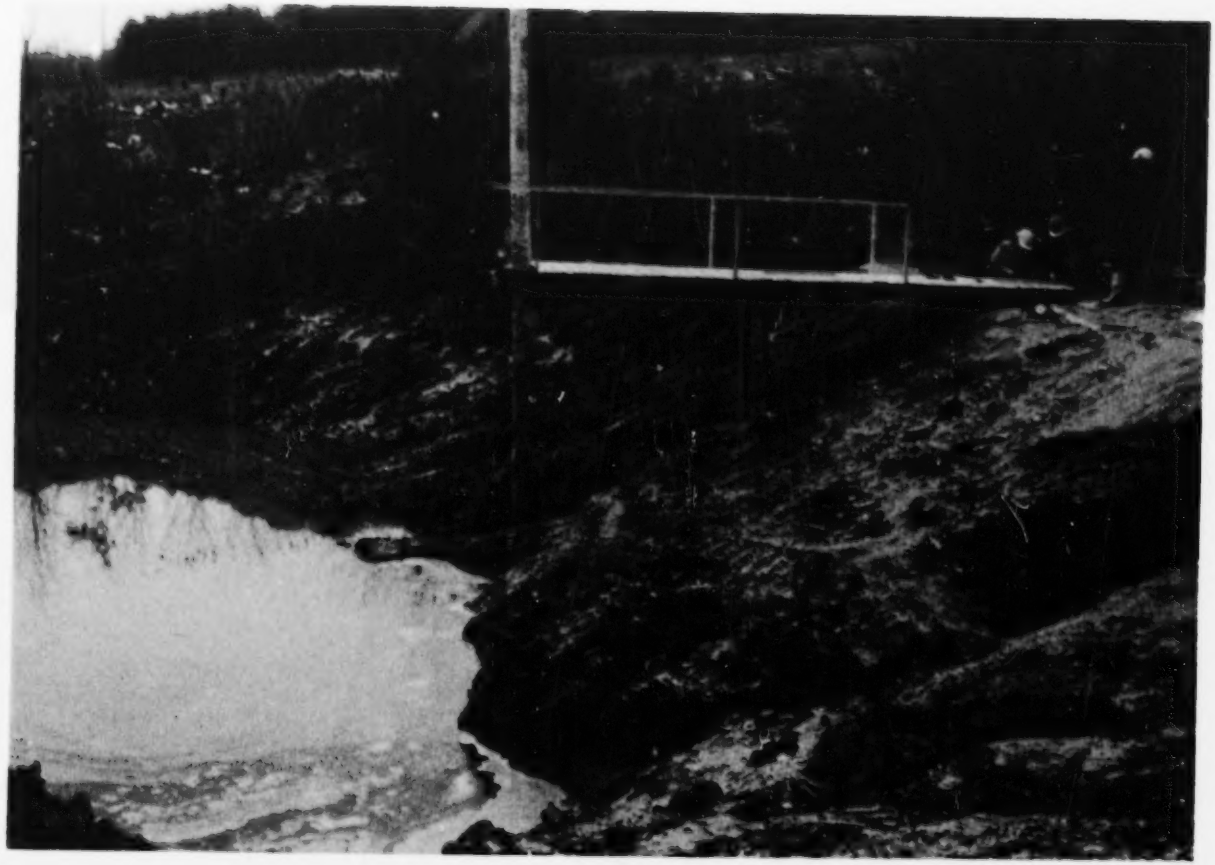
ARRANGEMENT OF DRUMS IN ROWS

ANOTHER VIEW OF DRUMS PRIOR TO CLEANUP

DRAINAGE FROM VALLEY AFTER RAIN

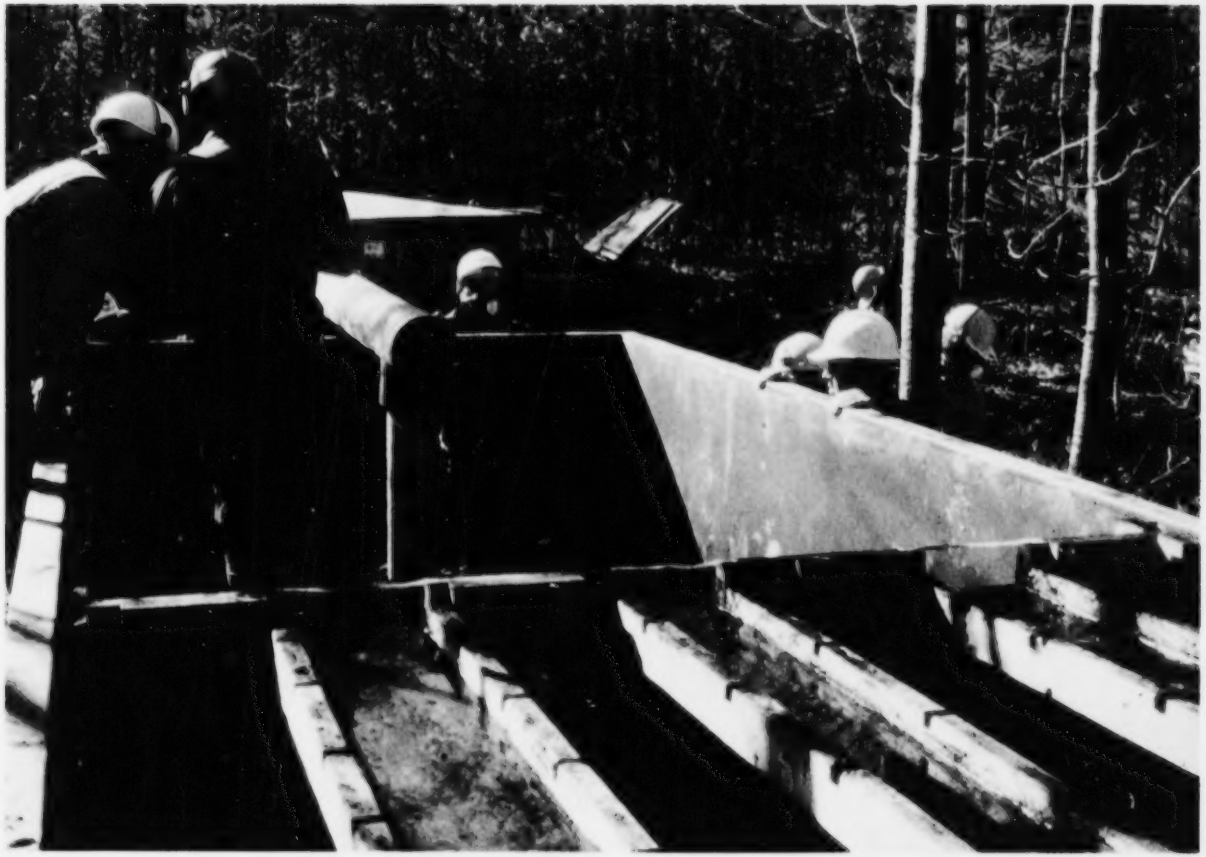
RUNOFF FROM VALLEY INTO WILSON CREEK

CONSTRUCTION OF INTERCEPTOR TRENCH
FOR COLLECTING RUNOFF



HOLDING POND FOR CONTAMINATED RUNOFF

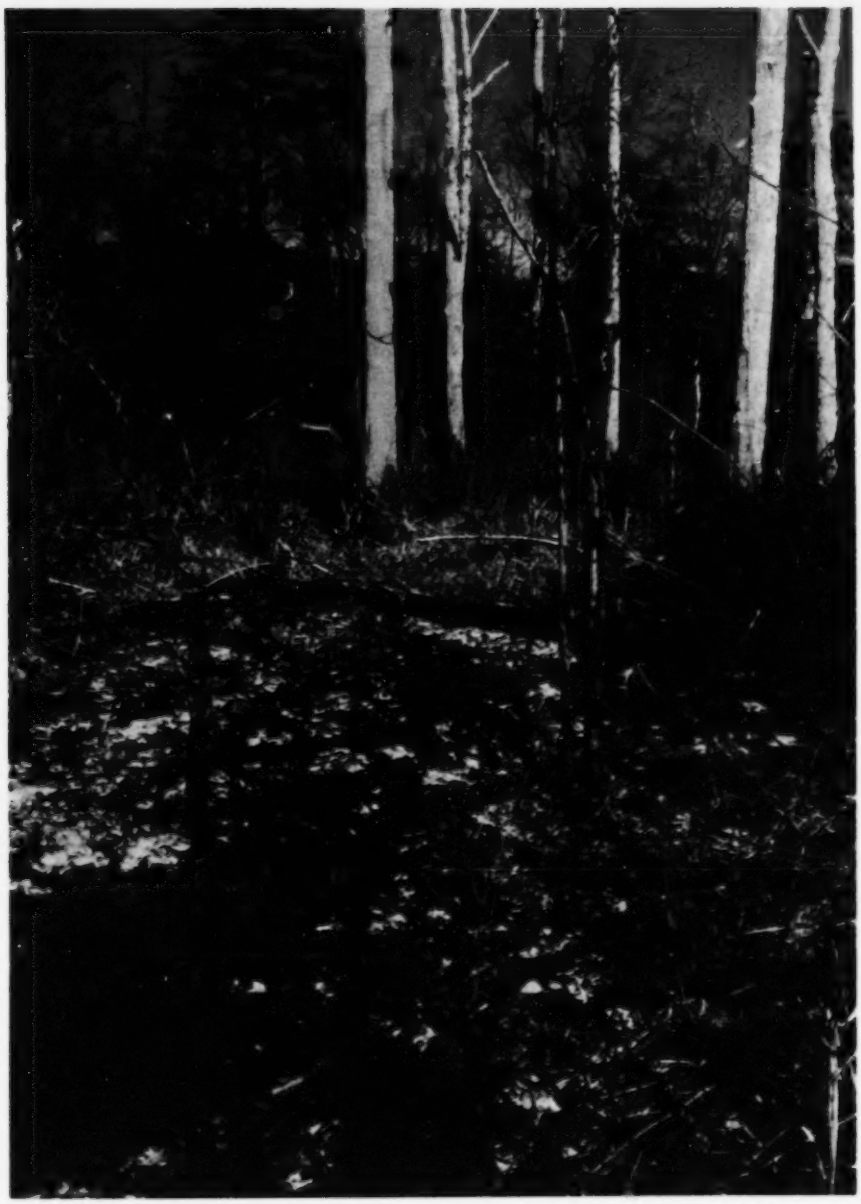
FLOATABLE MATERIALS ON HOLDING POND



CONSTRUCTION OF WASTE TREATMENT FACILITY

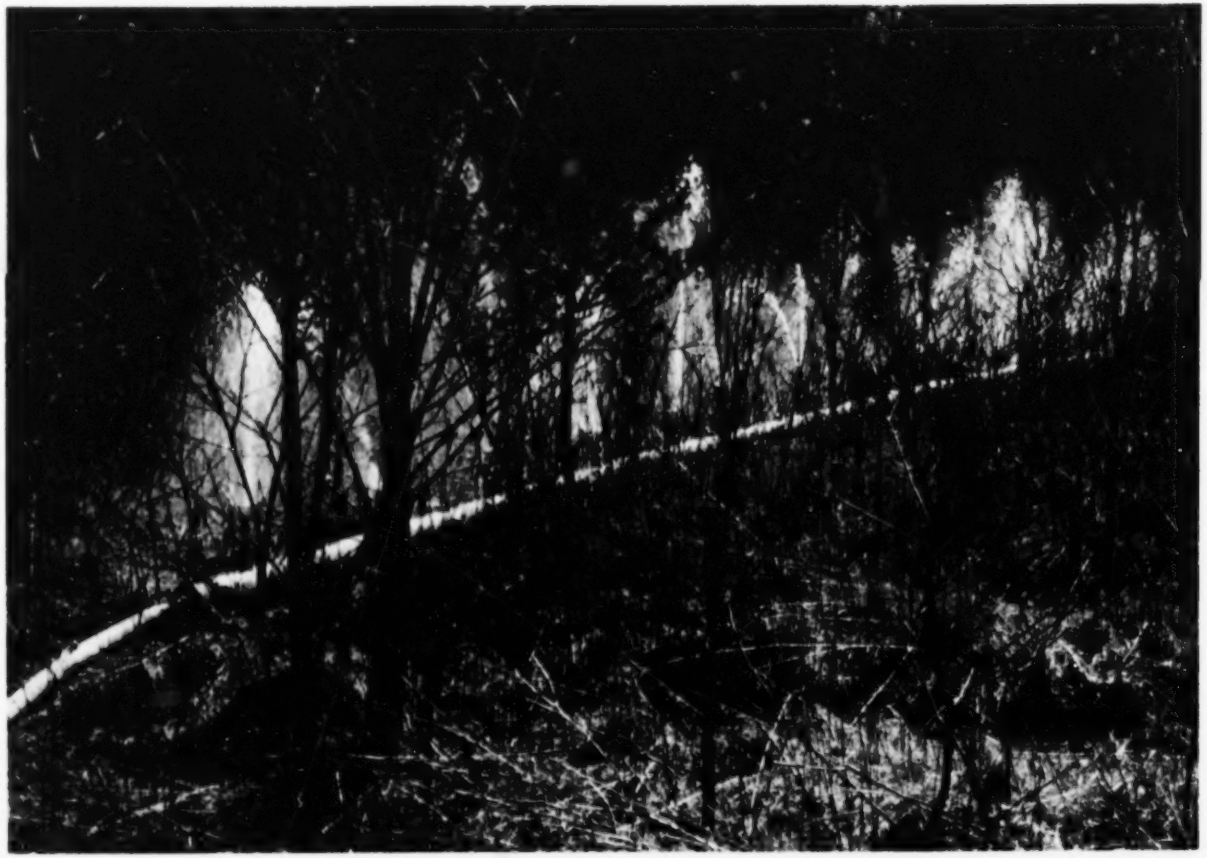
ANOTHER VIEW OF WASTE TREATMENT FACILITY

CONTAMINATED WATER BEING PUMPED FROM HOLDING POND TO FIRST CELL CONTAINING CRUSHED LIMESTONE FOR AERATION

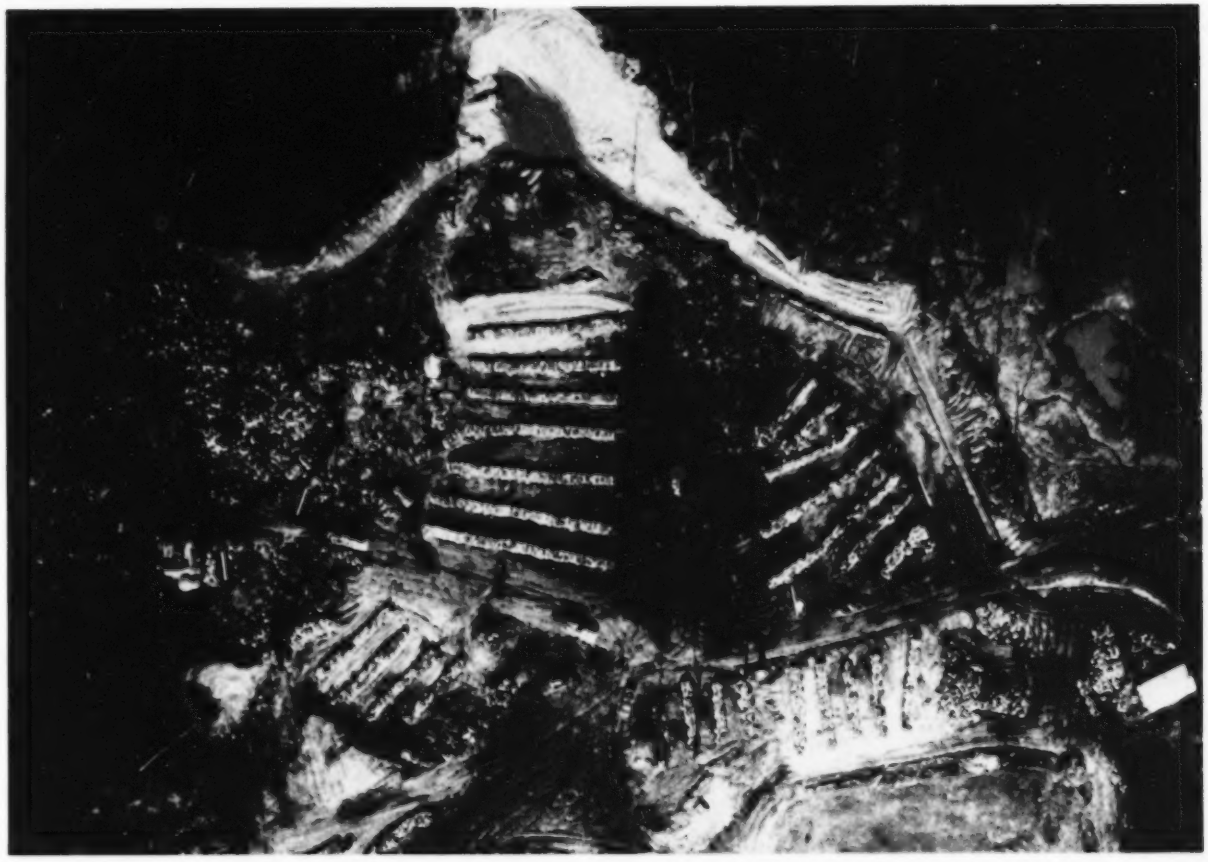


LEACHATE AND RUNOFF KILLED VEGETATION IN THIS AREA

IN-STREAM AERATION OF WILSON CREEK



AERATION OF WILSON CREEK TWO MILES
DOWNSTREAM FROM VALLEY



AERIAL VIEW OF VALLEY OF THE DRUMS NEAR
COMPLETION OF CLEANUP ACTIVITIES

4. CONTAINMENT AND TREATMENT

Introduction

Several industries located in the metropolitan area of Louisville, Kentucky, are involved in the production and/or manufacturing of automobiles, plastics, chemicals, paints, varnish, and organic solvent materials. They generate large quantities of industrial waste that must, or should be, disposed of in an approved manner. In past years, some of these industries transferred their waste products into drums and paid other companies or individuals to transport and dispose of the drums. During that period, the generators did not question the procedures utilized by the waste haulers in the disposal of these potentially hazardous substances.

On a 23-acre site in Bullitt County, Kentucky, nestled between a private golf course and a county park, more than 27,000 drums of industrial waste were found in 1978 by state and EPA officials. The collection and transport of the drums to this particular site began in 1967 and continued until the property owner's death in 1977. Due to limited space, the owner had constructed pits and trenches, filled them with industrial waste, and sold or crushed the empty drums. Later, the trenches were covered with soil from a nearby hill. Some estimates indicate that more than 100,000 drums were stored, buried, or dumped on this site. Eventually, weather conditions deteriorated the stored drums and the contents were spilled onto the ground, contaminating Wilson Creek via surface runoff and leachate from subsurface drainage. The adjacent property owners reported that, at times,

the waste materials on the water surface were multicolored. They also complained that the smell was unbearable during warm weather. There were also occasions when the spilled material ignited and created a fire on the stream and adjacent shorelines. The property owners also expressed concern that their water wells may have become contaminated by the spilled industrial waste.

On March 2, 1979, when the snow began to melt, the surface runoff from the dump site, now commonly referred to as the "Valley of the Drums," once again contaminated adjacent Wilson Creek. Personnel for the Kentucky Department of Natural Resources and Environmental Protection (KDNREP) advised the U.S. Environmental Protection Agency (EPA) of the incident and requested assistance. Since oil and mixed chemicals were discharged into surface waters, the federal Contingency Fund, PL: 92-500 Section 311(K), could be used to relieve the environmental emergency. Therefore, the Environmental Emergency Branch (EEB) of EPA Region IV was authorized to use the fund to control the runoff and eliminate further pollution of the stream.

Extensive sampling for both chemical and biological data was conducted in the drum storage area and the Wilson Creek drainage basin. The sample analyses indicated the presence of several organic compounds such as benzene, toluene, ketones, xylene, styrene, phthalates, and polychlorinated biphenyls (PCBs) in runoff and sediment samples. Low concentrations were also found in the benthic organisms. Altogether, there were 142 chemical compounds identified in the various samples collected in the "Valley of the Drums."

In order to relieve the emergency situation, the following temporary devices were constructed on-site:

Trenches to intercept the surface runoff and the underground lateral migration of pollutants through the soil.

A catchment basin to receive the runoff via the trenches.

A field-constructed activated carbon unit to treat contaminated water in the catchment basin.

In addition, drums were segregated and marked according to their contents, and organized in rows for future handling.

Although the problem of disposal still remains at this site for a large quantity of hazardous substances, a technically sound and economically feasible methodology for treating and controlling contaminated runoff was instituted.

In-Stream Treatment

Wilson Creek flows in an easterly direction to its confluence with Southern Ditch Creek. Subsequently, these waters flow into Pond Creek and the Ohio River near West Point, Kentucky. The "Valley of the Drums" lies in the headwaters of Wilson Creek where the normal flow is low and subject to fluctuations from seasonal water contributions. The stream bottom in these upper reaches consists mainly of sand and clay deposits. Years of contaminated runoff entering the stream covered the sediment with a gray residue. When the sediment was disturbed, a strong odor of solvent-type material was emitted. Floatable materials such as oil, xylene, and toluene were present on the water surface at the time. This condition persisted downstream for approximately 0.5 miles (0.9 kilometers). The initial response to this situation was to impede the flow of the contaminated waters of Wilson Creek. This was done by the construction of an underflow dam across Wilson Creek, downstream from the "Valley of the Drums." The underflow dam would contain the floatable material, but not the soluble organic compounds that were present in the water column. To achieve the removal of these organic compounds, ring aerators were placed in the stream at two locations: one immediately downstream from the "Valley" the other just upstream from the underflow dam. In addition, water was pumped from behind the dam through a header pipe and sprayed onto the adjacent land. Thus, aeration of the stream water released the volatile organics. The stream water was polished as it drained overland back into the creek above the dam.

Control and Collection of Surface Runoff

Drums of industrial wastes were scattered all over the 10-acre "Valley" site. In some areas, the drums were stacked 8-10 feet high.

They were badly weathered, some leaking, others empty. The soil was contaminated in some places to a depth of 10-12 inches. There were two small impoundments on the property. One contained ethylene glycol, the other about eight feet of sludge and waste material. During periods of rainfall or thaw, the ground became saturated and hazardous substances were flushed into Wilson Creek. On several occasions, especially after a heavy rainfall, these impoundments overflowed and drained into Wilson Creek.

Another serious problem lay underground where, for years, the operator had dumped industrial waste into pits or trenches. Once the pits were filled, they were covered with soil from a nearby hillside. Three large underground trenches were discovered on the "Valley" site. One trench, located about 50 yards upgrade from Wilson Creek, measured 10' x 150' x 8'. Other trenches, as yet undiscovered, may also exist. Thus, hazardous substances were not only entering Wilson Creek via surface runoff, but also by means of a lateral migration through the soil.

To control and collect both surface and subsurface drainage of contaminated waters, interceptor trenches were constructed at the base of the slope on the east side of the "Valley." In certain areas adjacent to the creek, the trenches were excavated to a depth of six feet. This was necesssary to ensure the interception of the subsurface drainage.

A catchment basin was also excavated to collect the runoff from the "Valley" site. The basin configuration was to accommodate a flow of 21 cfs for a retention time of 15 minutes. This design was based on a drainage area of 10 acres, a five-year storm, a runoff coefficient of 0.35, and the "Rational" form $Q = ACi$. At the time of the construction, it was estimated that the basin would last approximately three months. After nearly one year of service, the basin was still adequate and no overflow had been recorded.

Carbon Absorption Treatment System

In devising a system capable of treating the contaminated runoff held in the catchment basin, certain criteria had to be considered.

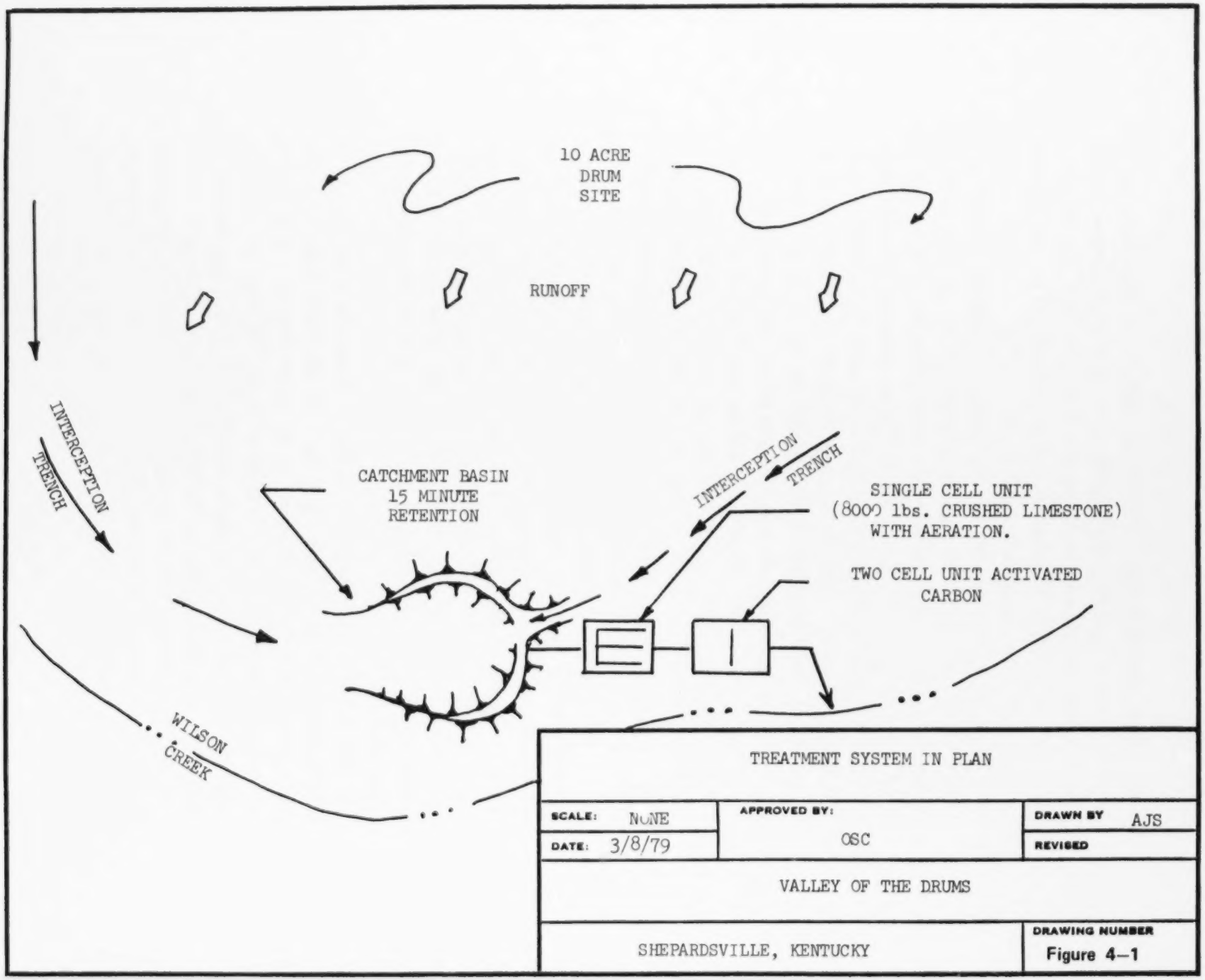
For example, the treatment system would have to be practical, inexpensive, easy to operate, and require a minimum of maintenance. In addition, the system must be temporary in nature, not a permanent facility, and capable of reducing the concentrations of the chemical constituents to an acceptable level.

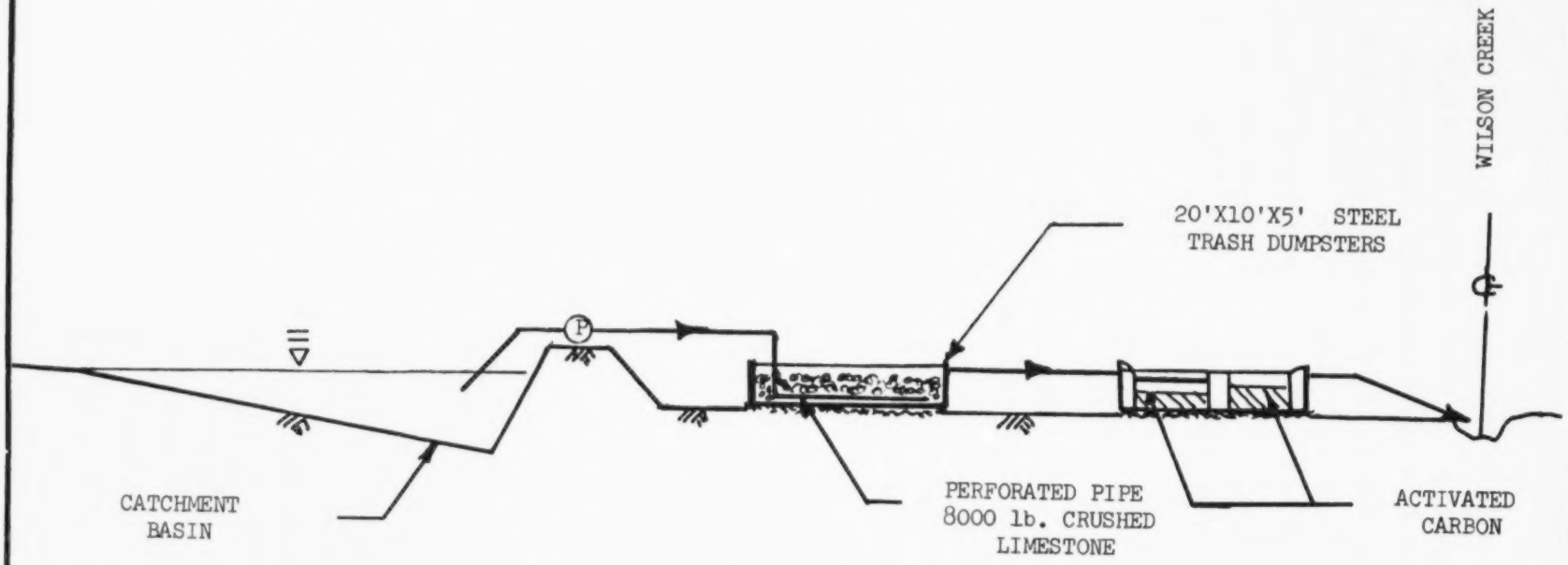
Activated carbon is specific for nonpolar molecules, which makes it useful in the removal of organic compounds. On numerous occasions, carbon columns have been utilized in treating spills of hazardous substances in the field. EPA was successful in removing PCBs and other organic compounds with a modified activated carbon treatment system in Whitehouse, Florida. Having examined the chemical data of the samples collected in February 1979, it was decided to construct a carbon absorption unit preceded by aeration and pH adjustment chamber.

Figures 4-1 and 4-2 depict the design and flow pattern of the treatment system. Two trash dumpsters (20' x 10' x 5') were made watertight by welding seams. They were placed on a bed of crushed rock. The first dumpster contained 8,000 pounds of crushed limestone. The limestone was used to elevate the pH to about 8. By doing this, some of the inorganic compounds could be precipitated. Compressed air was also pumped through a ring aerator, located at the bottom of the first unit, to remove the volatile organic compounds from the water column. The other dumpster was divided into two cells, both containing activated carbon. The piping was arranged so the contaminated water would flow up through the carbon in the second cell and be distributed over the carbon through a "V"-notch weir in the third and final cell.

The treatment system used a submersible pump to transfer the contaminated water from the catchment basin to the first dumpster. The pump was activated when the water in the basin reached a predetermined level. From the first through the third cell, the flow was by gravity. The effluent was discharged into Wilson Creek. The most efficient flow rate through the system was 60 gallons per minute.

The chemical analyses of the samples collected from the catchment basin and the effluent indicated a 99% reduction of organic compounds through the treatment system. Only toluene (3.0 mg/1) was detected in the effluent.


10 ACRE
DRUM
SITE
RUNOFF
INTERCEPTION
TRENCH
CATCHMENT BASIN
15 MINUTE
RETENTION
INTERCEPTION
TRENCH
SINGLE CELL UNIT
(8000 lbs. CRUSHED LIMESTONE)
WITH AERATION.
TWO CELL UNIT ACTIVATED
CARBON
WILSON
CREEK
TREATMENT SYSTEM IN PLAN
SCALE: NONE
APPROVED BY:
OSC
DRAWN BY AJS
DATE: 3/8/79
REVISED
VALLEY OF THE DRUMS
SHEPARDSVILLE, KENTUCKY
DRAWING NUMBER
Figure 4–1



TREATMENT SYSTEM PROFILE

SCALE: NONE	APPROVED BY: OSC	DRAWN BY AJS
DATE: 3/8/79		REVISED

VALLEY OF THE DRUMS

SHEPARDSVILLE, KENTUCKY

DRAWING NUMBER
Figure 4--2

One of the problems encountered with this system was the silting of carbon in the final two chambers. This was especially a problem after a heavy rain when the surface runoff contained a lot of soil. However, this problem was solved by spraying the basin with polyelectrolyte, which settled the soil to the bottom.

Maintenance for the treatment facility has been minimal. However, after a period of ten months, it was necessary to replace the motor for the aerator and the activated carbons in both units.

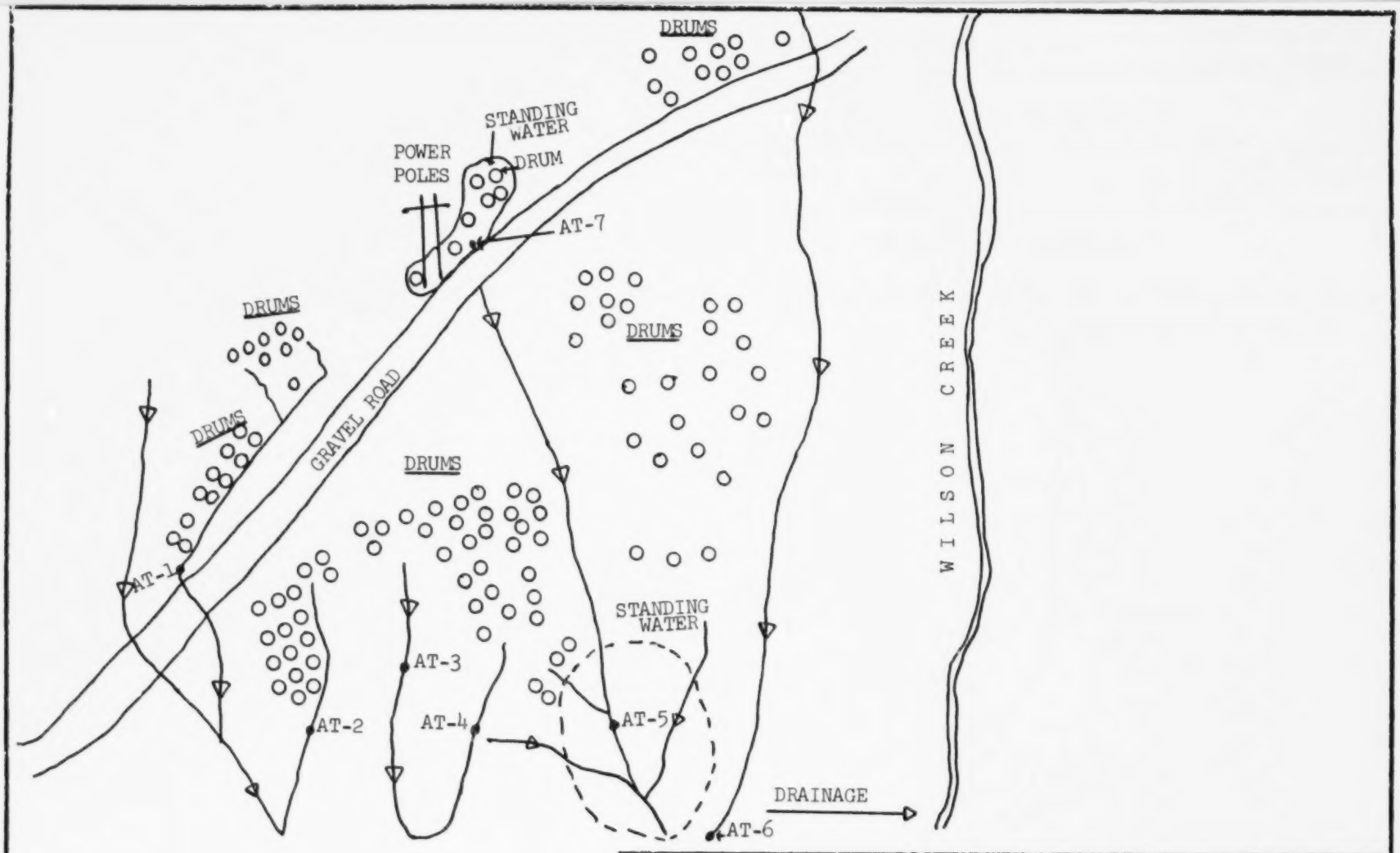
Chemical Analyses of Water and Sediment Samples

During the entire episode, water and sediment samples were collected from Wilson Creek and the treatment system. This was done by EPA Region IV personnel and a private contactor hired by EPA. The sampling at sites downstream from the "Valley" was part of a program to determine the effect of various hazardous waste disposal sites in and around the Louisville area. During the latter part of February 1979, specific sampling was performed on the "Valley" site to determine the types and quantities of hazardous substances present (Figure 4-3). At this time, water samples were collected from standing water and impoundments that were discharged into Wilson Creek. To determine the extent of contamination in the surface soils, specific site samples were collected. None of the drums was sampled because it would be cost-prohibitive and time-consuming for the emergency phase of the exercise.

Samples were transported to EPA's laboratory in Athens, Georgia, and analyzed according to acceptable analytical procedures.

Analysis revealed the presence of a vast array of inorganic and organic substances in the "Valley" proper and adjacent Wilson Creek. In treating the waste, the primary concern was the organic compounds. Seven water and sediment samples were collected in the drum storage area. Station AT5, a large pool of water in a small depression, had a large assortment of chemical compounds. Station AT1 and AT2 had the least number of chemical compounds present (Figure 4-4).

A large number of solvents, ketones, phthalates, benzene, phenols, and other organic compounds were found in the settling basin, Station AT7.



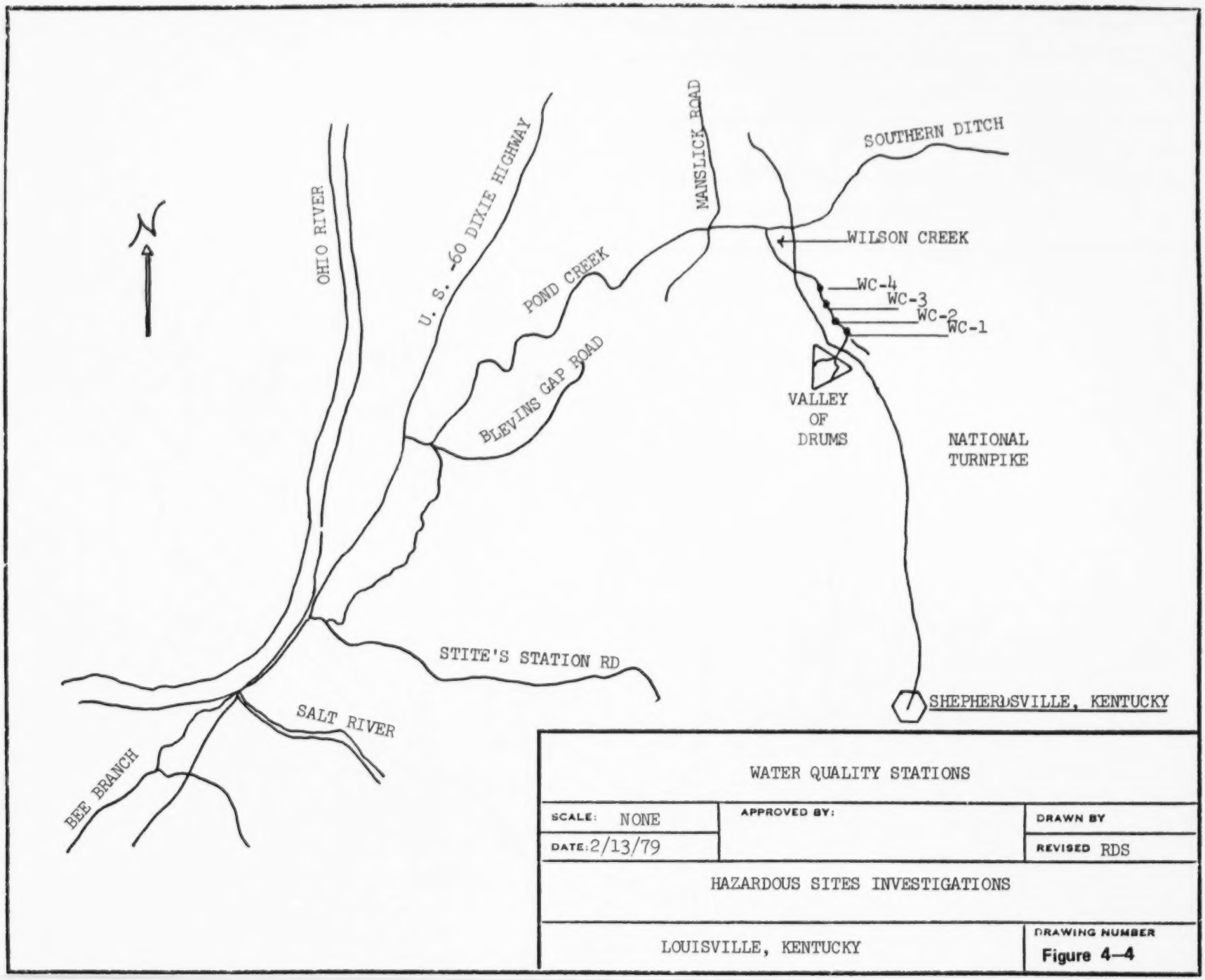
WATER AND SEDIMENT SAMPLING LOCATIONS

SCALE: NONE	APPROVED BY:	DRAWN BY
DATE: 2/22/79		REVISED RDS

VALLEY OF THE DRUMS

SHEPARDSVILLE, KENTUCKY

DRAWING NUMBER
Figure 4–3


N
OHIO RIVER
U. S. -60 DIXIE HIGHWAY
MANSLICK ROAD
SOUTHERN DITCH
WILSON CREEK
POND CREEK
WC-4
WC-3
WC-2
WC-1
BLEVINS GAP ROAD
VALLEY OF DRUMS
NATIONAL TURNPIKE
STITE'S STATION RD
SHEPHERDSVILLE, KENTUCKY
SALT RIVER
BEE BRANCH
WATER QUALITY STATIONS
SCALE: NONE
APPROVED BY:
DRAWN BY
DATE: 2/13/79
REVISED RDS
HAZARDOUS SITES INVESTIGATIONS
LOUISVILLE, KENTUCKY
DRAWING NUMBER
Figure 4-4

Station AT4 had the largest number of compounds; analysis of sediment samples identified 28. PCBs (Aroclor 1254 and 1260) were among the compounds identified from this particular station.

In general, the water samples contained more organic compounds than did the sediment samples. A total of 126 organic compounds were identified in the surface runoff. The results of the sampling are reported in Table 4-1.

Four stations along Wilson Creek were sampled (Figure 4-4) and analyzed by EPA and a private laboratory. Generally, the same organics detected in highest concentrations in water from the drum area were also present in Wilson Creek samples. Compounds present in the highest concentrations in these samples were: ethyl benzene, toluene, ethoxypropanol, acetone, and methyl ethyl ketone. Station WC2, located approximately 170 yards downstream from the site, had the highest concentration of compounds detected.

A number of organic compounds were detected in the stream sediments at relatively low concentrations (less than 5 mg/kg). The largest number was detected at Station WC4, located approximately 600 yards downstream from the "Valley" site. At this point, the stream had a more defined streambed, which facilitated greater sedimentation. Low concentrations (0.01-3.0 mg/kg) of PCBs (Aroclor 1254 and Aroclor 1260) were detected in all of the Wilson Creek sediment samples. However, no PCBs were detected in the water samples.

On-Site Housekeeping and Source Control

Prior to closing the emergency phase of the exercise, drums were segregated and marked according to their contents, i.e., liquid, solid, sludge, or empty. The empty drums that could not be reused were crushed and piled in various locations on the property. The drums were also arranged in rows to facilitate future handling and disposal of the waste.

Cost

This five-week intensive effort cost the Government $300,000. The treatment system, including one year maintenance, power, and carbon recharge, accounted for $45,000 of the amount.

Table 4–1 TEST RESULTS OF WATER AND SEDIMENT SAMPLING

COMPOUND ug/l	AT-1		AT-2		AT-3		AT-4		AT-5		AT-6		AT-7	
	Water	Sed.	Water	Sed.	Water	Sed.	Water	Sed.	Water	Sed.	Water	Sed.	Water	Sed.
Benzoic Acid									1-25		1-10		10-50	
Methyl Benzoic Acid					10-100		10-100		1-25		1-10		10-50	
C_2 Alkyl Benzoic Acid					10-100		1-10		1-25		1-10		1-10	
C_4 Alkyl Benzoic Acid							1-10				1-10		1-10	
Methyl Benzene Sulfunamide			3.9					37	1-25				1-10	
Unidentified Compounds 1-10 ug/l			7		18		16	1	24		20			
Unidentified Compounds 10-100 ug/l	1		6		11		11	330	13		1			
Xylene (2 isomers)					260		120		470		62		380	
Methyl Pentanol													37	
Methyl Cyclopentanol													42	
Dimethyl Pentanone													37	
Butoxyethanol													23	
Methyl Hydroxy Pentanone					24		170	10-100	220		28		200	
C_2 Alkyl Benzene (3 isomers)					64		21		7.2		5.7		24	
Cyclohexanone									2.4				66	
Dibutoxymethanol (2 isomers)					65		150		86		15		60	
Methyl Styrene					48			10-100					9	
C_5 Alkyl Benzene (5 isomers)					22		11		26				28	
a, a, Dimethyl Benzene Methanol					5.6						19		86	
C_2 Alkyl Styrene					4.7								7.3	
Methyl Benzene Methanol													7.3	
Isophorone											15		37	
Phenoxy Methyl Oxirene								1-10					15	
Phenyl Ether --											1.4		2.7	
Chlorophenoxy Propanol													18	
Dimethyl Phtnalate							8.7		8.6		13		16	
Phenoxy Propanediol													57	
Tetra oxadodecane			220		6.6		20		7.2		2.7		29	
Diethyl Phthalate	9.4		17		42		4.9		29		26		44	
Methyl Propyl Ester of Benzoic					7.5				17				3.7	
Acid					27						4.7		4.1	
Pentaoxapentadecane			320		3.8		4.9	120	36		7.4		37	
Bis (2-ethylhexyl) Phthalate	13		45										10-50	
Methyl Butanoic Acid													1-10	

Table 4—1 TEST RESULTS OF WATER AND SEDIMENT SAMPLING (Cont.)

COMPOUND ug/l	AT-1		AT-2		AT-3		AT-4		AT-5	AT-6	AT-7
	Water	Sed.	Water	Sed.	Water	Sed.	Water	Sed.	Water Sed.	Water Sed.	Water Sed.
Pentanoic Acid								T<1			
Phenol							T<1	9.5	T<1	T<1	44
Methyl Phenol							1-10		1-25	1-10	10-50
C_2 Alkyl Phenol					1-10				1-25	100	1-10
C_4 Alkyl Phenol					96				1-25		1-10
Ethyl Hexanoic Acid							42		10-100	10-100	10-50
Dimethyl Propanol							10-100			380	10-50
Phthalic Acid							1-10	8	1-25	100	1-10
trans-1,2-dichloroethylene	T<5	T<.025	T<5		75	T<.025	26		36	T<5	6.4
Toluene					340	.29	160		180		160
Ethyl Benzene					69	0.6	10		24		31
Acetone						6.0			400		730
Trichlorotrifluoroethane											5.4
Methyl Ethyl Ketone					330				410		690
Hexane											2.3
Methyl Isobutyl Ketone							880		1100		1600
2-Hexanol							78		9.6	T<5	37
2-methyl-1-propanol							T<5		T 5		5.2
Tetrachloroethane	6.4		18		12		5.7		0.2	6.2	
1-butanol									T<5		T<5
1-hexanol									T<5		
1, 1-dichloroethane					T<5		T<5		T<5		T<5
Vinyl Chloride											
Dimethyl disulfide					6		T<5				T<5
Methylene Chloride	6.6		7.9		5.3				9.4	7.4	
Tri methyl Cyclohexanone					32					15	
Methyl Benzene Methanol										1.2	
Carbonic Acid										3.5	
Propoxx Butane					38					1.2	
Di-n-butyl Phthalate	39		7.5		5.6	1-10	10		9.6	16	
Fluoranthene							4.9		7.2	T<1	
Dimethyl Phenol										1-10	
Hexanol Acid										12	
Hydroxy Methoxy Benzene					1-10				1-25	1-10	
Pentachlorophenol										4.3	
Naphthalene					1.9	11	T<1		4.5		
1, 1, -trichloroethane									9.4		
Camphor									230		

Table 4–1 TEST RESULTS OF WATER AND SEDIMENT SAMPLING (Cont.)

COMPOUND ug/l	AT-1		AT-2		AT-3		AT-4		AT-5		AT-6		AT-7	
	Water	Sed.	Water	Sed.	Water	Sed.	Water	Sed.	Water	Sed.	Water	Sed.	Water	Sed.
C_3 Alkyl Benzoic Acid						1-10	1-10		1-25					
Methylesters of Ethyl Hexanoic Acid									1-25					
Benzene Propanic Acid									1-25					
Heptanol									14					
Heptanone									220					
Incene									2.4					
Methyl (methylethanol) cyclohexanol									62					
a-Terpineol									400					
Terpinene									110					
Isophorone					49		20		19					
Quinoline									9.6					
Methyl Naphthalene								1-10	9.6					
Acenaphthene									12					
Dipenzofuran									4.8					
Beta-Naphthonitrile									4.8					
Fluorene									72					
Tributyl Ester of Phosphoric Acid									7.2					
Phenanthrene/Anthracene								1-10	5.7					
Butyl Methyl Benzene Sulfonamide									17					
Pyrene									2.2					
Methyl Octanone									2.2					
Butoxy Propanol							3.5							
C_2 Alkyl Styrene					4.7		6.2							
Methyl (Propoxyloxy) Ethoxy Propanol					24		110							
Butyoxy Ethoxy Ethanol							12							
Dimethyl Phenol							11							
Tetra methyl Pentanone							1-10							
Dibutyl Ether					5.6		0.2							
C_5 Alkyl Benzene					1.4									
C_3 Alkyl Phenol					11			1-10						
Alkyl Styrene					2.5			1-10						
Methyl Heptenone			4.5											

Conclusion

This entire project up to the point of marking and "rowing" the drums was conducted under P.L. 91-500 Section 311..."Spill Response." Section 311 "K" funds were used. The Regional Response Team was the decision-making body and the federal On-Scene Coordinator was provided by EPA. The state of Kentucky Department of Natural Resources and Environmental Protection was important to the exercise. State water, solid waste, and geologic officials aided the OSC throughout.

There are technical concepts that can be made both efficient and economical in such emergencies. However, beyond this phase, there is a larger and more difficult problem. Ultimately, the entire "Valley" must be cleaned up and secured.

The information contained in this report may aid others in distinguishing the emergency phase from the overall massive total cleanup phase. Under current federal pollution laws, there is a reasonable well-defined severence point. The Regional Response Team remains the best judge of this critical point.